

Summary

What we have learned in this module?

- Different multimedia data and their representations
 - Audio
 - Image/Graphics
 - Video
- Colour model and perception
 - Different colour models (benefits and applications): RGB, CMYK, YUV, YIQ, L*a*b*...
 - Chroma subsampling (why and how)



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Fundamental Tools

- Nyquist theorem
- Fourier Transform and Discrete Cosine Transform:
Frequency Analysis
- Information theory and basic compression techniques:
 - Run-length encoding
 - Entropy encoding (Shannn-Fano, Huffman, arithmetic)
 - LZW
 - Predictive/Differential encoding
 - Frequency Domain Compression
 - Vector Quantisation



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Audio

- Processing: Digital Audio Effects [CM0268]
- Synthesis: Additive, Subtractive, FM, Wavetable, Sample-based, Granular, Physical
- Compression:
 - Traits of human hearing system
 - MPEG Audio, Dolby AC
- Representation: MIDI, MPEG-4 Structured Audio



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Image

- Representations: monochrome (dithering), index (LUT), greyscale, true-colour
- Compression:
 - What to exploit?
 - JPEG: true colour
 - GIF: index



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Video

- Compression:
 - What to exploit?
 - Motion Compensation based Prediction (H.261)
 - Bidirectional (B) frames (MPEG-1/2)
 - Object-based coding, synthetic objects (MPEG-4)
 - Various technical improvements: flexible macroblock partition, subpixel motion estimation, multiple references etc. (MPEG-4 AVC)



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Beyond the Material

- Problem-solving skills, e.g. the development of various methods for video compression
- Identify the challenge: what is the real problem?
- Learn the nature: what to exploit?
- Understand the practice: e.g. encoder / decoder balance
- Push forward: how can we do better?
- Last but not least, curiosity and enthusiasm!



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